

TECHNICAL MEMORANDUM

Nutrient Scientific Technical Exchange Partnership and Support (N-STEPS)

To: Iffy Davis, Jacques Oliver
From: Michael Paul
Subject: Flowing Waters Fact Sheet Review
Date: 21 January 2011

The following are specific comments on the flowing waters fact sheet.

Overall, I think the approach described here is generally defensible. The methods, provided in supporting documents, are transparent and theoretically reproducible. The collection methods used were all standard and, in theory, involve a QAQC plan that the state has to cover its monitoring efforts. In addition, much of the analytical work described has been through peer review and published. This, in my opinion, strengthens the defensibility. Some of the analyses used, while supported by science at the time the analyses were completed, have received more criticism and are not the principal methods recommended by the recent USEPA Stressor-Response guidance (USEPA 2010 EPA-820-S-10-001) (<http://water.epa.gov/scitech/swguidance/waterquality/standards/criteria/aqlife/pollutants/nutrient/upload/finalstressor2010.pdf>). This having been said, the specific criteria values derived are likely defensible and would likely protect the uses described although the values chosen were based on protection of biological condition on the high end of the response curve (e.g., 95% likelihood of exceeding the NBI) and there is some concern that this could be perceived as insufficiently protective. The greatest concern is with the assessment and listing methodology which appears to be insufficiently protective, in my opinion. See comments below.

Specific Comments:

p.2. The criteria described here are clear as to their magnitude and duration (summertime means) and frequency (not to be exceeded). This clarity could be used for the recreational uses document.

p.6. The use of the 25th of all sites is generally only recommended if a reference population is not available, as I understand. I would not take the median of these two. The reference population value has primacy since the 25th of all estimate is really only used as an estimate of the former in its absence. Mixing the two introduces unneeded and very present uncertainty.

Also, the median of two values is a mean, is it not? Otherwise, how is it estimated? Even so, my recommendation is to drop the 25th percentile estimate for the reason stated above.

p.7. These trophic states are ones you put on the data for convenience - they are not truly trophic states, correct? They just broke into low, medium, high nutrients but these concentrations are not actually related to trophic state are they? They also represent a change

TECHNICAL MEMORANDUM

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in biological condition that are not related to aquatic life use expectations, and for these purposes that is most important. I see from the Smith et al. 2007 manuscript how the NBIs track on these bins, but how do the NBI bins relate to values NY considers unacceptable in aquatic life use terms (Fig 6 from that document is promising)? How do the biological changes across these sites relate to, say, percent model affinity scores or something the state uses for making ALU determinations (BAP)? Are the changes observed significant from an aquatic life use attainment standpoint? A plot of NBI vs BAP would help.

p. 10. nCPA has a good numbers of issues associated with it, come of which are outlined in the new USEPA Stressor-Response guidance, which the authors are encouraged to read, others which are not. Ostensibly, nCPA will always identify changepoints, whether they are ecologically significant or not and its application to linear response relationships or one's that can be linearized due to log-normal response may not be appropriate. Interpolation to acceptable biological endpoints on the y-axis may be a more defensible approach, therefore. We realize, however, that such insights were not available when these analyses were done and we are unsure of how it would affect the results.

p. 11 Table

Isn't the median of two values a mean?

Why using medians instead of geo-means. There is nearly an order of magnitude variance among these values. Would not a mean be more appropriate, especially a geo-mean?

p. 13. Conditional probabilities, too, have come under more scrutiny. Please, again, see the new USEPA S-R guidance for a discussion. I think the manner in which they are used here – interpolating a 95thile from the graph may be better than running change-point analysis on conditional probability, which is less defensible now. But, there are still some issues with the math of CP and the representativeness of the underlying data affecting applicability. These were not randomly selected sites, correct? Therefore the CP plot only applies to them and cannot be inferred to represent sites across the state in general.

Moreover, why is the 95th percentile chosen? This seems like an indefensibly high bar to have set. You are saying, in other words, that the criterion should be set where you are 95% likely to have a NBI exceedance of 5 (bad conditions). Aren't you managing towards likely disaster with that approach? Why not <50% likelihood?

p. 15. State is to be applauded for using weight of evidence or multiple line or whatever the proper term is these days. I think, given comments above, that some of these lines may need to be down-weighted or removed. If you remove CP for instance, it will have an effect, likely dramatic, on the resultant value (by my calculations, TP would become 30 ug/L and TN would become 686 ug/L, – reductions of more than 50%). This kind of sensitivity is worthy of great

TECHNICAL MEMORANDUM

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caution in keeping any one value.

p.17-20. As for the recreational waters document, I think the ALMs are where the greatest concerns are. In essence, you are not proposing nutrient criteria in my opinion. You are proposing aquatic life use criterion with a stressor identification process built into it to assign nutrients as a cause. There is no way for elevated nutrients alone, no matter how high they are, to trigger a nutrient impairment. The statement on p.18, “Instances may arise where natural nutrients concentrations are higher than the AWQV guidance but the NBIs are below the assessment criteria” is essentially a risk statement. This could be said of ALL pollutants and is why the classification process is so important (minimizing natural variability within classes) and why states have site specific alternative/natural condition provisions. The requirement you have of biological verification is akin to saying, “this patient has a risky level of cholesterol, but is not having a heart attack or high BP, therefore nothing needs to be done”. That is not a protective strategy – it is a risky strategy in my opinion. Why would you wait until impacts appear (heart attack = high NBI score in streams) before taking impairment action? How is it protective of the use if the use has to be impacted before taking action? Combining Figures 5 and 6 from Smith et al. 2007, by the time the NBI 6 is reached, there is a 65-90% chance of some impairment (slight to moderate) in aquatic life.

This issue is fairly to substantially serious, in my opinion. The state and EPA need to decide if this risk is substantial enough to warrant revision, but my role is to point out the technical risk to the resource represented in such an approach.

I believe the values proposed are likely defensible (with the caveat of revisiting them with the CP value removed and revisiting the S-R line all together) and likely borderline protective if established as stand-alone criteria. I think the proposed ALM is not technically sound.

pp. 21-22. Same concerns as above. This would need to be revised so that Boxes A and C trigger nutrient reductions to be protective of the uses. Site specific exceptions could be allowed as for any other pollutant.